The Influence of Drivers' Personal Characteristics in Understanding Traffic Sign Symbols in Nnewi Urban, Nigeria

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Abstract

Traffic signs are the oldest and most commonly used Traffic Control Device (TCD). The success of these signs depends on their comprehensibility by the drivers. There is a general perception that drivers in Nnewi do not have a satisfactory level of understanding of traffic signs and often, this is thought to be a major cause of road accident occurrences along its expressways. This study is aimed at investigating the role of Nnewi commercial drivers' personal characteristics in understanding of traffic signs. Survey research method was employed in this study. Both primary and secondary data were used in the study. 200 copies of questionnaire were administered across the 13 major commercial motor parks in the study area. Simple random sampling techniques was used to proportionately select the respondents in each of the motor parks. The research findings showed a poor understanding level of drivers to traffic signs in the study area. The percentage understanding level of these commercial drivers to traffic signs was aggregated to 41%. The result of the study showed that the average percentages of drivers who correctly understood the warning and regulatory/prohibitory signs were 67% and 58%, respectively. The study further revealed that drivers' personal characteristics has much influence on understanding traffic signs. Again, it was revealed from the study that age, education and years of driving experience played prominent roles in drivers' understanding of signs, however marital status and gender had no effect

Key Words: *Personal, Traffics, signs*

1. INTRODUCTION

In recent years, the number of vehicles on roads has increased due to technological and economical advancement. As a result of this increase, traffic has been one of the most important parts of our daily lives as people spend more time in traffic thereby making drivers and other road users to face a higher risk of traffic accident. Traffic signs are the oldest and most commonly used traffic control device (TCD). (Chisomnau, 2014). They are signs placed on roads to provide information to road users. Traffic signs use colour, shape, and words to convey information. The earliest road signs were mile stones giving distance and direction. Later, signs with directional arms were introduced. Pre industrial signs were made of stone or wood but gradually, in the late nineteenth and eighteenth

century painted cast iron became favoured. Cast iron continued to be used till the mid-20th century but was gradually displaced by aluminium, pressed malleable iron and steel.

Literature revealed that there was absence of good driving culture on most Nigerian roads and Highways (Anthony-Albanese, 2010; Baluja, 2010; Kirmizioglu, 2010). According to Otani et al (1988), Nigerian roads then, were dominated by abundant combination of inexperienced, drunk and overconfident drivers who are unconcerned about the lives of other road users as well as theirs. There were further claimed that many commercial vehicle drivers knew nothing more than the rudiments of moving vehicles and hooting their horns ostensibly to attract the attention of passengers. WHO (2004) corroborated this when they states that most Nigerian drivers have no regard whatsoever to traffic rules and regulations. They do not observe speed limit or traffic signs on highways, many drivers overtake anywhere and anyhow on roads and highways, while some park their vehicles anyhow on the roads with no thought of the other road users ,its also understood that drivers do not have proper understanding of posted signs by the road side . The traffic situation then was described as chaotic and unpredictable, public interest on road safety matters was minimal and there was no concrete and sustained policy action to addressed road safety questions (FRSC, 2007). Hence, there was high rate of road traffic accident and fatalities.

There have been incidences of road traffic crashes in various cities of Nigeria and these have been attributed to reckless driving, over speeding, dangerous overtaking drunkenness and ignorance of traffic regulations. (Richards et. al. 1988) Nnewi, one of the prominent urban areas in Anambra State, a south eastern state of Nigeria in Sub sahara African region, is characterized with drivers with different personal characteristics, it could be argued that level of knowledge and understanding of posted traffic signs by these drivers has much influence in the incidents of road traffic accidents in the area. Again, though arguably, it can be noted that there is a relationship between driver personal characteristics and there comprehension of the posted traffic signs, however this has not been empirically proven. In other words, the influence of these drivers' personal characteristics on understanding traffic signs symbol is still an issue to be empirically investigated. According to Chukwu (2007) various level of road safety education that had been embarked on by the Federal Road Safety Corps (FRSC) in Nnewi, the study area, have focused on the maintenance of vehicles, the need to abstain from alcohol and other related issues . The effect of the drivers' personal characteristic on understanding traffic signs symbol has not been considered at any time, hence the problem of this study is therefore to ascertain the contribution of commercial drivers' personal characteristics on their ability to understand traffic sign symbols in Nnewi, Anambra state. This study is aimed at investigating the role of Nnewi commercial drivers' personal characteristics in understanding of traffic signs. The objectives were to (i) identify the general level of understanding traffic signs among commercial drivers in Nnewi (ii) determine the percentage of drivers that correctly understood the various traffic signs (Warning & Regulatory - Prohibitory Signs), (iii) determine the extent of influence of personal characteristics of the drivers on understanding of traffic signs and (iv) determine the drivers' personal characteristics that play prominent roles in drivers' understanding of traffic signs. The study hypothesized that the number of posted traffic signs understood by drivers is not significantly related to the personal and social characteristics of drivers. (The personal characteristics of drivers are measured by age, monthly income, years of education, years of driving experience, accident per experience, marital status, sex and gender - these are the independent variables, while the dependent variable is the number of posted traffic signs understood by drivers). The outcome of this study is of great significant to Urban Planners, Police -Motor and

Traffic Division (NP-MTD) and to Federal Road Safety Corps (FRSC) in the proper location of traffic signs as well as aid in the field of traffic education and policy making. Findings of the study would be of great importance to the policy makers in setting and positioning traffic signs, at positions that will aid road users and drivers in improving their understanding of these traffic signs. The study will as well serve to researchers as reference point in the field of traffic studies.

2. CASE STUDY AREA

Nnewi, is one of the commercial hub in Anambra State of Nigeria. It lies approximately on latitude 06º 21º N and 06º 30º and longitude 07º 26º E and 07º 37Eº of Anambra State of Nigeria. It has an estimated land area of about 72.8 square kilometers. Nnewi has a total land area of about 12,831 kilometer and is the second city in Anambra state that has commercial prominence. Nnewi and its immediate environs are located in a rainy forest vegetation zone, characterized by long elephant grasses in the cultivation parts and in the areas subject to bush burning, by shrubs and trees, sometimes building into thick forest along the riverbanks of Idemili, Ubuh, Ekulo, Obolo, Eze and Miri ele. The most common trees are the palm, (Elias Guinness) and mahogany, whose long taproots and hard backs enable it to survive the long taproots and hard backs enable it to survive the long dry season and to resist serious damage by the bush fires. The economic base of Nnewi is strong. It derives its income from the industrial, commercial establishments and informal activities, and less from agriculture. Generally, over the last decade, both industrial production and commercial activities have been on the rise.

With regard to commerce, Nnewi has grown from a traditional market to become a major international market, attracting people from various parts of the world and the regions of the country South-East and all other parts of Nigeria, notably the South-West, North-East and South-South. There are more than six other daily markets, which specialize in the sale of various social goods and services e.g. Electronic Market, Electrical Dealers Market, Timber Market, and Building Materials Market. The urban transportation space in Nnewi consists of one transport system; road. The road transportation would be classified into national highway (trunk A road), regional highway (trunk A road), major roads (trunk B road), secondary roads, collector roads, local road and pedestrian network.

National highway road: this is the highest road hierarchy in Nnewi. The roads link various points of economic and social centres as well as rural areas and regions. This road serves as a direct transport route for goods and passengers for both medium and long term journey. Example of this classification of road is Okigwe-Onitsha express road and Nnewi – Owerri express road.

Regional highway road: this road links urban and rural areas within the state. They also carry goods and passengers at medium length journey. Example of this classification of road is Awka road and Onitsha .

Major roads: this road links various land uses in Nnewi. It forms the major flows of transportation network. The speed limit on this road is minimal since it combines both high and low traffic. The road lanes are usually two. Example of this classification of road is Igwe Orizu road and Ogbufor road.

Secondary roads: this road links various roads within a single land use (residential, commercial, industrial). Example of this classification of road is izuchukwu road, Amauko road and Edoezemewi road.

Collector road: this road feeds the secondary road. The speed is generally low. They are not travel

roads but designed to serve local people. Example of this classification of road is Bank road, St Mary road, Akaboukwu road.

Local road: this road links sub units (plots and housing units). It is also known as street roads. They form the back bone of road circulation. All streets in Nnewi are under this category.

Pedestrian network: this is a type of circulation that generates safe movement for all age groups in Nnewi. It is a system that separates pedestrian and vehicles. The width is not more than 2 meters. The speed allowed is working speed. Recently, the system is to be incorporated in roads in nnewi.

The development of commerce and industry, in a town like Nnewi being one of the major centers for entrepreneur activity. Nnewi has the highest level of manpower resources and the lowest level of poverty incidence in the south-east geo-political zone. As an industrial town, Nnewi is known as the 'land of gold', also referred to as the 'Japan of Africa'. Commerce, industry and education have helped the rapid growth of Nnewi as it has attracted industrialists, workers, students, teachers and traders all seeking work. Agriculture is a thriving industry for people living in the towns and villages surrounding Nnewi. Residential land- use account for the highest land use comprising about 54.3% of total urban area in Nnewi. Nnewi has about twenty (20) distinct neighborhoods that may be broadly categorize as low, medium and high-density areas. It is pertinent to note the housing types are typical of density areas.. In the low-density areas, bungalows and duplexes are common. Due to the influences of spread effects, mixed densities exist. Planned and unplanned areas sprang alongside Enugu metropolis as a result of a high demand in residential accommodations. That is to say that the urban residential space in Enugu metropolis is not necessary a continuous zone but an arbitrarily defined circumscribing area of about sixteen neighborhoods and some intervening open spaces

3. LITERATURE REVIEW

Hashim and Abdul-Rahman (2002) carried out a research on role of drivers' personal characteristics in understanding traffic sign symbols in five Arabian Gulf countries. The results in their research indicated problems with the level of comprehension among the drivers about the traffic signs. 55% and 56% of drivers correctly identified the regulatory signs and warning signs respectively. Age, gender, education and income played major roles in determining drivers' comprehension of signs whereas marital status showed no significant effect. Young drivers, female, those with lower levels of education or lower incomes understand the signs significantly worse than drivers who are older, male, with higher levels of education or higher incomes.

Hashim and Abdul-Rahman (2002) carried out another research on driver's comprehension of traffic signs based on their personal and social characteristics in Bahrain, Kuwait, Oman, Qatar and United Arab Emirates. In their research, it was concluded that drivers comprehended only 56% of the posted signs. Education, monthly income and nationality were related to drivers' comprehension of traffic signs. Western drivers comprehended the signs better than other nationalities and male drivers scored higher than female ones. Age, marital status, driving experience and accident rates had no effect on drivers comprehension of signs. The result indicated that drivers' personal characteristics are primarily associated with their understanding capabilities and not with their accident involvement rates.

Alexander and Sheela Alex (2010) also carried out a study on the modelling of traffic sign comprehensibility of drivers using artificial neural network in Trivandrum India. The result of the study is satisfactory that drivers are and understand traffic sign.

Makinde and Opeyemi (2012) carried out a study in Akure, Nigeria on the understanding of traffic signs by drivers. The result of their research indicated that generally drivers have a poor understanding of traffic signs and signs understood by drivers are no parking, no‘’U’’turn, speed limit and stop at intersection because the signs are self explanatory in terms of their graphics.

Hulbert et al. (1979) studied drivers' comprehension of eight traffic sign symbols using data from over 3100 respondents from across the USA. Significant differences in comprehension as per age were found in seven signs. Level of comprehension was 70% for drivers aged under 24 years, 79% for those 24–50 years old, and 72%for those over 50 years old. Cataloguing.Al-Madani, (2000) applied a pictorial technique using multiple choice questions to evaluate motorists' comprehension of control devices for railroad grade crossing signs in the USA. Their results indicated that very young drivers (under 19 years) and older drivers (over 54 years) have difficulties understanding and recognizing such devices. No significant difference between male and female was observed. However, a significant difference between novice and experienced drivers was observed.

Odgen et al. (1990) measured motorist comprehension of signs applied in urban arterial work zones in Houston, their sample consisted of 205 voluntary respondents at a mall and a licensing office. The interviewed participants were asked to respond to multiple-choice questions about signs and other forms of traffic control devices using a booklet of photographs. The study did not consider the characteristics of the respondents. There spond percentages of correct responses revealed that motorists have some difficulty interpreting both word and symbol messages on signs. The lane-ends symbol sign, for example, was identified correctly by 78% of the respondents.

Luoma, & Rama, (1998) required respondents to rate various warning signs on three dimensions, (a)perception of risk,(b) likelihood to disregard, and (c) familiarity with the message. They also emphasized that not all of the signs produced differences due to age. Furthermore, they found higher risk perception to be related to lower likelihood of ignoring the signs. Alexander and Sheela (2010) found that drivers commit significant errors in detecting symbolic signs compared with alpha numeric ones. Alphanumeric signs are better, as per drivers' reaction time, when compared with symbolic ones, so are warning signs compared with regulatory signs (Dewar et al., 1994).

Hawkins et al. (1993) surveyed 1745 drivers in Texas, at driver licensing stations, to assess their comprehension of signs using a video tape. Respondents' comprehension was found to be significantly increasing with age for only one sign (speed zone). At least four of the tested signs were misunderstood by elderly drivers. Furthermore, no significant relationships between age and misunderstanding of one tenth of the tested signs were observed. Men were better than women in correctly identifying some of the signs. One-third of the signs were misunderstood by non-English speaking drivers. Respondents with less than high school education misunderstood one fifth of the signs.

Dewar et al.(1994) evaluated age differences in comprehension of traffic sign symbols using 480 volunteer licensed drivers in the USA and Canada. The sample included 85 colour slides of standard US sign symbols. Older drivers had poorer understanding than younger ones in 39% of the symbols examined; for the remainder there were no differences with respect to age. Needs for a systematic and comprehensive evaluation of drivers' understanding of the symbols used on roadway signs to

know where best to concentrate efforts was strongly recommended by Dewar, et al. (1994), Luoma and Rama (1998) found recall of speed signs not to be affected by drivers' age and sex.

Al-Madani & Abdul- Ghani (1995) and Al-Madani & Al-Janahi (2000) investigated the influence of drivers' comprehension of signs on accident involvement, citations received and seat belt usage. While knowledge of signs was increasing with seat belt usage, no significant association with accident involvement was observed; even when age was incorporated with the accidents. Similarly, no significant difference with number of citations received was observed. Furthermore, those with no speed citations, or low number of speed citations, were not significantly better than those with high number of speed citations.

4. METHODS AND PROCEDURE

Survey research method was employed in this study. Both primary and secondary data were used in the study. Primary data were collected with the aid of structured questionnaire and interviews. Secondary data which include selected traffic signs were obtained mainly from published materials by the Federal Road Safety Commission Traffic Handbook. 300 copies of questionnaire were administered across the 13 major commercial motor parks in the study area. This sample size represents 18.5 percent of the total population (1,083), that is, National Union of Road Transport Workers' registered commercial drivers in Nnewi was used in this study. 96% success was recorded as 287 properly filled copies of questionnaire were returned and used for analysis in the study. Simple random sampling techniques was used to proportionately select the respondents in each of the motor parks.. Multiple Linear Regression was used to test the hypothesis

5. RESULTS AND DISCUSSION

In this section, the respondents' age, educational status, marital status, household size (family members) and monthly income were discussed as seen in table 1.

Table 1: General characteristics of respondents (n=287)

Characteristics	Statistics (n = 287)
1. Sex	male (100.00%), Female (Nil)
2. Marital status	Married (70.7%), Single (29.3%),)
3. Age	<20 years (44.8%), 21-30 years(32.4%), 31- 40years (10%), >40 years (5.2%
4. Family members	1(9.8%), 2(11.9%), 3 and more (78.3%)
5. Education	No formal Education(12.2%), Primary school(15.7%), Secondary (37%), Vocation school (22.7%), Tertiary(12.4%)
6. Income	Less than N10,000(3.7%), N10,000 – N19,900 (8.6%), N20,000 – N39,900(35.8%), N40,000 – N59,000(20.4%), N60,000 – above(31.5%)

Source: Field Survey, 2012.

Table 1 shows a summary of the background of the respondents. It was seen that all the commercial drivers that were sampled in the study were male, non was a females.
Furthermore, the responses from the respondents indicate that 70.7% of the respondents are married while the remaining are singles people, this implies that most of the commercial drivers are predominantly married as clearly shown from table 1. The educational status of the respondents shows that only 29.9% of the respondents had less that primary school education. The remaining 70.1% had secondary school qualification. This shows that the majorities of the respondents are literate and would give objective answers to the questions asked. Thus, increasing the internal validity of the study.

Again, an examination of income of the respondents reveals that 3.7 percent of the commercial drivers earn a monthly income less than N10,000.00. This group contributes to the least number. About 8.6 percent of them earn income of N10,000 – N19,900. . Those who earn above N60,000 accounts for only 31.5 percent of the respondents

Driving Characteristics of Drivers Table 2 represents the driving characteristics of the drivers; the result shows that 73% of the drivers drive between (4-7) days per week, 24.3% drive between (2-3) days per week, and only 2.7% drive in a day per week.

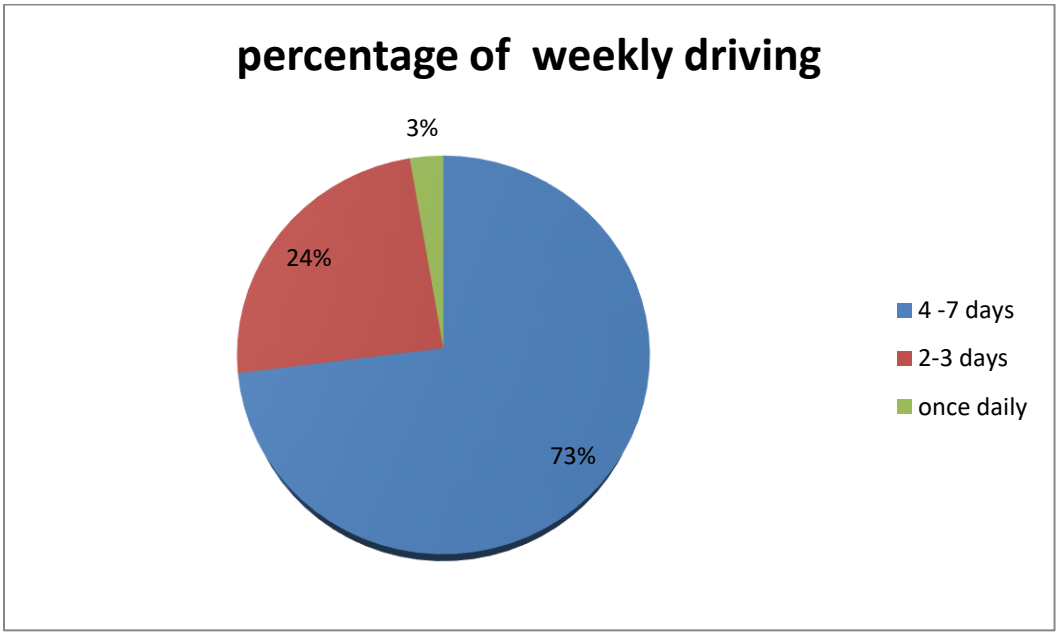
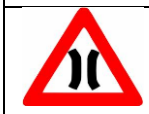
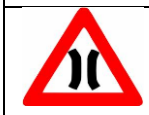


Figure 1 : driving rate

Approximately 94.1% of the drivers drive for job with only 5.9% not driving for job. 100% of the drivers sees and obeys traffic signs along the road. Similarly, 53% of the drivers had driving experience of 6-10years, 29.2% had a driving experience below 5years and 17.8% has a driving experience of 10 years and above.

Drivers Understanding Of Traffic Signs

Table 3: Drivers Understanding of Warning Signs

Traffic signs	**Meaning**	**Percentage (%)**
	Y – Junction	58
	Dangerous Double Bend (First to Left)	20
	Narrow Bridge Ahead	80
	Give Way to traffic	62
	Cross Road or Four-Way Junction	50
	T – Junction	54
	Dangerous Bend Right	58
	Roundabout	81
	Long Grade Dangerous Hill	49

	Children crossing	55

(Warning & Regulatory - Prohibitory Signs) Table 3 shows the result of drivers' understanding of warning signs. A total of 10 warning signs were evaluated in this study. The average percentage of correct answers of these signs was 47%, which indicated that the understanding was very poor. The signs that were understood well by drivers were "Narrow Bridge Ahead 80%, Roundabout 81%, School Children Crossing 55% and T-Junction 54%". These relative high percentages could be attributed to the self explanatory graphics in the signs. The least understood traffic sign is "Dangerous Double Bend 20%.

Mandatory Signs

Table 3: Drivers Understanding of mandatory signs

Traffic signs	Meaning	Percentage (%)
	No Right Turn	48
	No Parking	48
	No Left Turn	75
	No U-Turn	93
	Stop at intersection	87

	No Overtaking	48
	Speed Limit	89
	No Horn	89
	No Waiting	66
	No Stopping	58

A total of 10 mandatory signs were evaluated in the study. The results of drivers' understanding of the signs are presented in table 4. The average percentage of correct answers was 58%, which indicated that the understanding was very poor. The signs that were understood well by drivers were "No Parking 92%, No U-Turn 76%, Speed limit 71% and Stop at Intersection 71%". These high percentages of correct answers can be attributed to the self explanatory graphics in this mandatory signs.

The result of the hypothesis of the study showed that the number of posted traffic signs understood by drivers not significantly related to the personal and social characteristics of drivers. ($R^2 = 0.909$, Adjusted $R^2 = 0.811$, $F = 117.734$, $p = 0.000$, $p<0.01$ significant level). This shows a strong significant relationship between drivers' personal characteristics and their understanding of traffic signs. Furthermore, the T-values which were obtained from the analysis show how the dependent variable relates to the independent variables on individual basis. Significant T-values were obtained for years of driving experience by drivers, age of drivers, and educational level of drivers at ($P<0.05$). Marital status and genders of the drivers however, did not have a significant impact on the understanding rate of the drivers (Significant values of .0603 and 0.786 respectively at ($P>0.05$ significant value). In other words, age, education and years of driving experience played prominent roles in drivers' understanding of signs, however marital status and gender had no effect

The study revealed empirically that the drivers with B.Sc and Higher National Diploma (HND) understood traffic signs more than the drivers with WAEC and OND. Similarly, the drivers with age range of 26-30 and 30- 35 do have a better understanding of traffic signs more than the younger ones. In other words, older drivers showed a better understanding of traffic signs. Younger drivers between the age of 18-25 years understood posted signs but when compared with the older drivers, the older drivers understood significantly better. This is similar to the study done by Dewar et al (1994).

Again, the drivers with driving experience of 6-10years and 10years & above do have a clear and better understanding of traffic signs which can also be attributed to the advancement in age and the attendance of driving school. The younger drivers with lesser driving experience understood posted signs but their understanding cannot be compared to that of the older drivers. This can be attributed to the fact that they did not attend driving school but learnt driving through other means.

6. **CONCLUSION AND RECOMMENDATIONS**

The understanding of traffic signs by drivers is an important factor in order to enhance maximum safety on the roads. Road signs as a means of communication are used in providing necessary information about the road and its environment to road users especially the drivers.

Road signs are intended to provide information to drivers. Such a system is usually assumed to be an effective communication tool for the road users. Results
from this study indicated that such communication is not promising at all. There are substantial problems with the level of comprehension among the drivers about the symbolic traffic signs. The percentage of the drivers who gave correct responses to the signs is often low. The drivers know just over half of the traffic signs which they encounter daily.
Young drivers (below 24 years) understand the signs significantly less well than older ones. However, middle aged drivers (35–44 years) are as good as older ones.
Furthermore, years of driving experience has no influence in improving comprehension of signs of the drivers who obtain their license after the age of 44. Marriage does not enhance knowledge of signs. Western drivers are better than the drivers of all the other nationalities even when age and education are controlled. Drivers who are females, having lower levels of education or lower incomes are not as good as males, with higher levels of education or higher incomes. These findings generally agree with the findings of other researchers on problems drivers have in understanding signs.
The findings are believed to be important for the designers and manufacturers of traffic signs especially when international applications are considered. They may, as well, assist the decision makers, in the field of traffic education, to better allocate the resources by concentrating their efforts on drivers who lack good understanding of symbolic signs when various reformatory programs are envisaged. Although, it would be difficult for all drivers to achieve a complete understanding of all traffic signs, yet, there is a large scope for significant improvement. Special attention should go in to improving the means of learning signing systems when driving licenses are obtained.
Extra emphasis should be given to the drivers who are female, young, those with low income and those holding low educational backgrounds. It is recommended to further study the drivers' comprehension of signs considering the influence of the following parameters carefully: drivers'

compliance with the signs, behavioral aspects with particular attention to age-related attitudes and possible sensitizing effect of the signs. The latter is important because the driver although may not comprehend a particular sign, yet it may awaken correct responses. Further microanalysis, as per individual sign, is needed to identify those signs which are least comprehended by the drivers.

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